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ABSTRACT

This study investigated the implementation of a 7th grade biology curriculum ("Animal and its Environment") in Israel. The curriculum has seven parts, each one with a dictated sequence including well-defined objectives, suitable activities, and assigned materials, with little degree of freedom for the teacher. A primary concern for the study was to identify reasons for dissatisfaction which has accompanied new science curricula implementation. The sample included 42 junior high school teachers in 28 schools spread throughout the central area of Israel, and included urban, rural, and kibbutz schools. Discrepancies between original curriculum intentions and their translation to formal materials, and discrepancies between developed learning activities and their operation in the classroom were examined, focusing on sub-variables related to the objectives, materials, activities, and strategies between ideal (philosophical directions) and formal (translation of ideal into tangible materials) levels. Results are reported for non-traditional sub-variables implemented completely, traditional variables implemented fully, and non-traditional sub-variables implemented in ways which were not in accordance with the aims of the curriculum developers. Although some objectives were implemented (including those related to subject matter and integrating laboratory work into regular class sessions), others (mainly those related to affective domain and higher order inquiry) were partially/totally lacking. (JN)

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# Is the Disappointment in Science Curriculum Implementation Justified?

## Some Insights into an Israeli Case

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This study investigated the implementation of a biology curriculum in Israel of the High School level. A primary concern of the study was to identify reasons for the dissatisfaction which has accompanied new science curricula implementation.

Two common approaches to implementation studies are distinct: the fidelity and the mutual adaptation approach (Fullan & Pomfret, 1977). The approach that is taken in implementation studies should follow the developers curricular approach. The fidelity approach focuses on the prescribed methods & products and looks for the congruancy between the developers intentions and their central implementation results. In contrast the mutual adaptation approach looks at implementation with an open view of both process and product. Unexpected products are a critical concern in this approach and so are changes that take place as a result of the interaction between the materials learners and the implementors. The structured sequential character of the chosen curriculum, dictated selecting the "fidelity" approach for our study of implementation.

Other studies using this approach have found significant discrepancies between the developers intentions and actual implementation (Goodlad & Klein, 1970; Herron, 1971; Goodlad, 1977). Discrepancies between the curriculum intentions and implementation, between expected outcomes and the actual outcomes and between a hoped situation and the realist one - are commonly found. (Provus, 1971; Anderson et al, 1975). Earlier implementation studies revealed clues as to the problems leading to discrepancies (Gallagher, 1967; Herron 1971). For example poor teacher preparation for using recommended strategies and inadequate directions in teachers' curriculum materials created incongruancies (Goodlad & Klein, 1970). Later more comprehensive studies gave a fuller picture of

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implementation reality and increased the feeling of disappointment (Goodlad, 1977; Stake, 1978; McIntyre & Brown, 1978; Kempa, 1978). The disappointment expressed as a result of studies in the U.S. and western countries was a motivating factor for the present study. More specifically, the study was designed to determine whether the implementation discrepancies discovered in the U.S. exist in Israel and if so, reasons for such discrepancies. The remainder of this paper will present the methods of inquiry and findings of the study.

The Conceptual Framework:

There are various well designed models for curriculum analysis (Tyler & Klein, 1971; Eash, 1972; Eraut, 1974). Since curriculum implementation is a complex process involving many participants and levels of development, there is a need for a comprehensive model of analysis. Goodlads (et al. 1979) model which served as the basis for the study of schooling in the U.S. (Klein et al. 1979) meets this need .

This model includes five levels of curriculum: ideal, formal, instructional, operational, and experiential. The ideal level of curriculum is where the phylosophical directions are determined. This level sets the ultimate expectations derived from the particular phylosophy. The formal level represents the first translation of the ideal into tangable materials. The teacher's conception of the formal materials is referred to as the instructional level. What is actually observed in classroom implementation of the curriculum is designated as the operational level. Students perception of the curriculum and their learning outcomes represents the final level of the model.

Each of these levels consist of common elements which Goodlads' et al refers to as curricular and qualitative variables. Of the 9 curricular variables (Fig. 1) we have chosen to follow: the four more frequently addressed-objectives, materials

strategies and activities. Selecting these variables led us to use Adar & Fox (1978) definition as "the learning materials that were prepared especially for instructional and learning purposes in the classroom. These materials may include rationale, a list of education objectives, syllabus, text books, students work sheets, a teacher's guide, and aids in other media".

( Fig. 1)

Methods and Instruments

The curriculum chosen to be studied is "Animal and Its Environment" (Silberstien 1968) for 7th grade junior high school. This curriculum has seven parts each one with a dictated sequence including well defined objectives, suitable activities, and assigned materials, with little degree of freedom for the teacher. To study this curriculum we have chosen to combine experimental quantitative method with a naturalistic qualitative one (Feinberg 1977, Erickson, 1977). This way we could obtain information that would lead perhaps to better understanding and more insights than if we used just one of the methods*.

The full account of both quantitative and qualitiative parts of the study are given in a 200 page report (Sabar, 1982). This paper however is limited to a brief presentation of the qualitative part meaning the ideal, formal and operational (observations) levels.

Sampling: The sample was not random since only teachers who agreed to have their classes observed could participate. The sample included 42 junior high school teachers in 28 schools. The schools were spread mainly throughout the central area of Israel, and included urban, rural, and kibutz schools. A total of 1015 students were enrolled

* We must however point out that we faced difficulties to an extent we did not know at the beginning of the study, caused by an attempt to compare the different curriculum levels. The comparison often required us to make compromises, while still waiting for better methodological solutions.

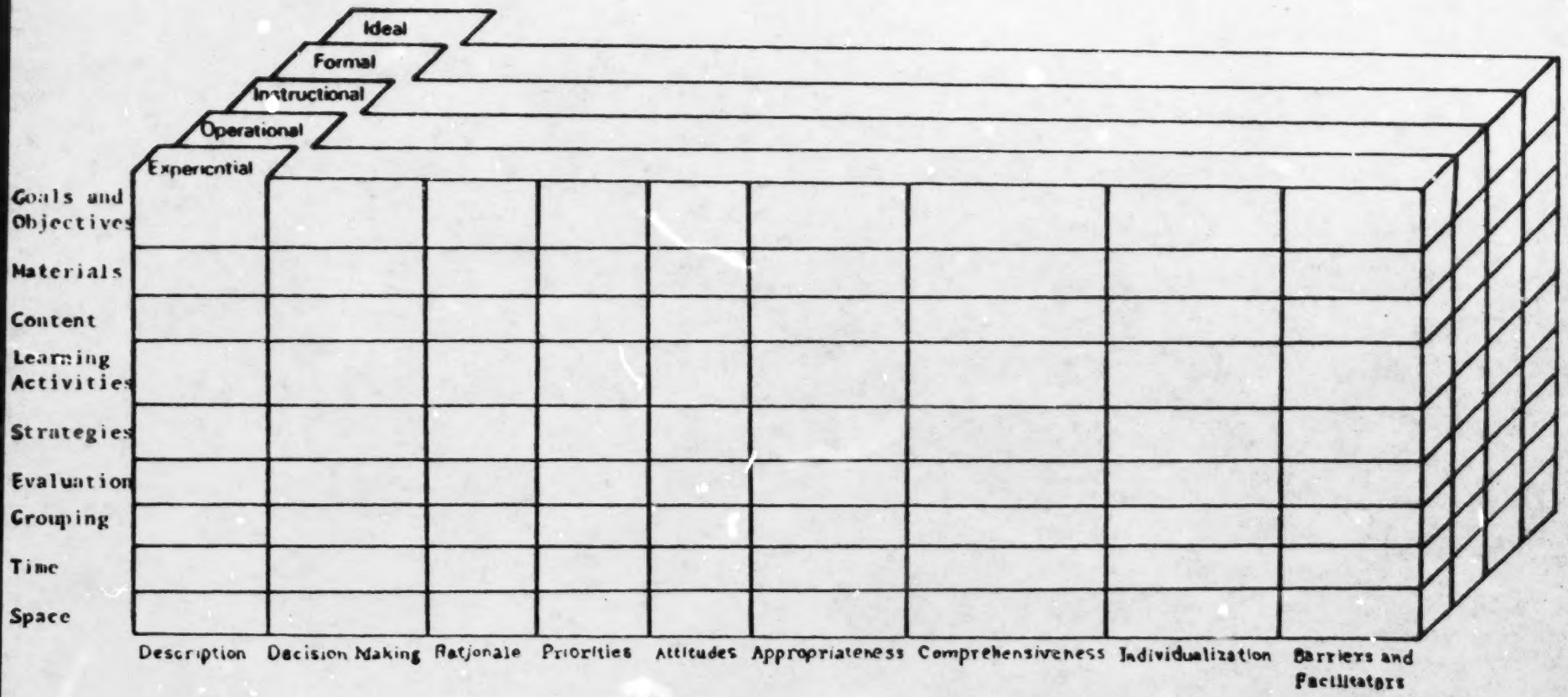


Figure 1. Framework for data collection in five curricular domains.

in these classes. The students are regarded as average and above in terms of general academic achievements.

Instruments - Information about the intents of the ideal and formal levels were based on: documents and articles written by the developers, as well as the actual learning materials. From these materials we have listed our criteria for content analysis (Grobman 1971) and tested it carefully in a pilot study.

The criteria were defined in the ideal and formal levels for the four selected variables, (objectives, materials, strategies, and activities). These criteria served later as the basis to excerpt several sub variables for each of the four variables. Sub variables were also excerpted from their open experiences in the pilot study.

For the variable objectives we had excerpted 14 * sub variables covering three areas of objectives "ideas and principles in biology" (first 6 sub variables on fig. 2) "principles of inquiry" (next four combined sub variables on fig. 2) "affective and communication skills in biology" (last four sub variables on fig. 2). The variable materials is made of seven sub variables (fig. 3). For the variable activities we have excerpted five sub variables (fig. 4) and for the variable strategies there are five sub variables (fig. 5).

Method of Scoring the analysis - In our pilot study we often have found that a sub variable gained its importance through the mode in which it was mentioned.** We decided therefore to have two dimensional analysis for each sub variable: frequency and intensity. Frequency: In each chapter and later for the whole program, the appearance of each sub variable in a variable, was counted. i.e. in the variable materials how many times does the sub variable "text books" appears. After counting each of the sub variables in a variable, we found out the range between the lowest frequency sub variable i.e. (2) to the highest frequency sub variable i.e. (13) in

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* The number of subvariables that could be identified easily in the ideal & formal levels.
** For the analysis the program was divided into units. Each such unit was an event regarding an engagement in an activity (i.e. observation) during one topic, as mentioned in the student's or teacher's materials or both.

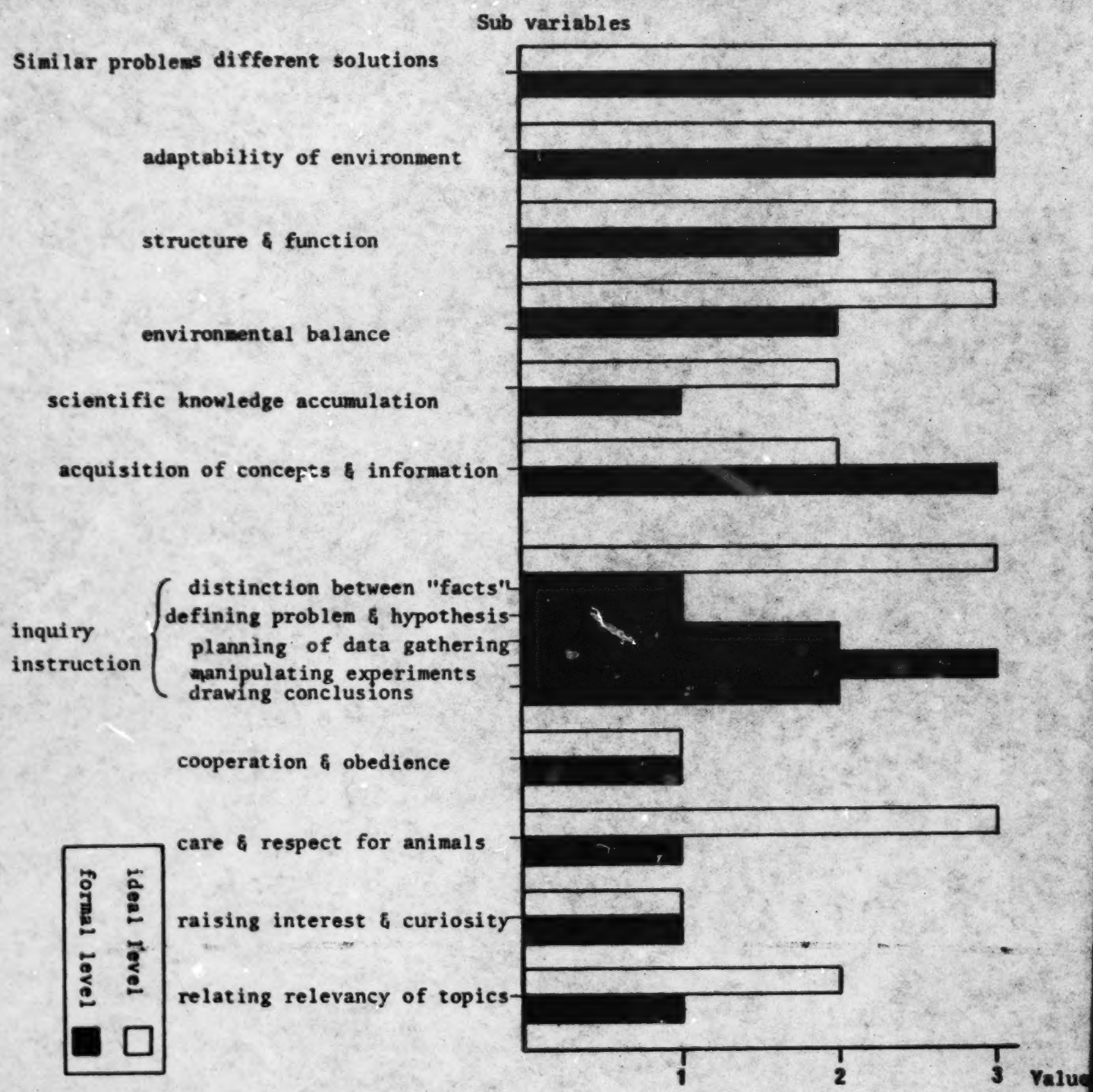



Figure 2. The congruency of the sub variables in objectives between the ideal and formal levels.

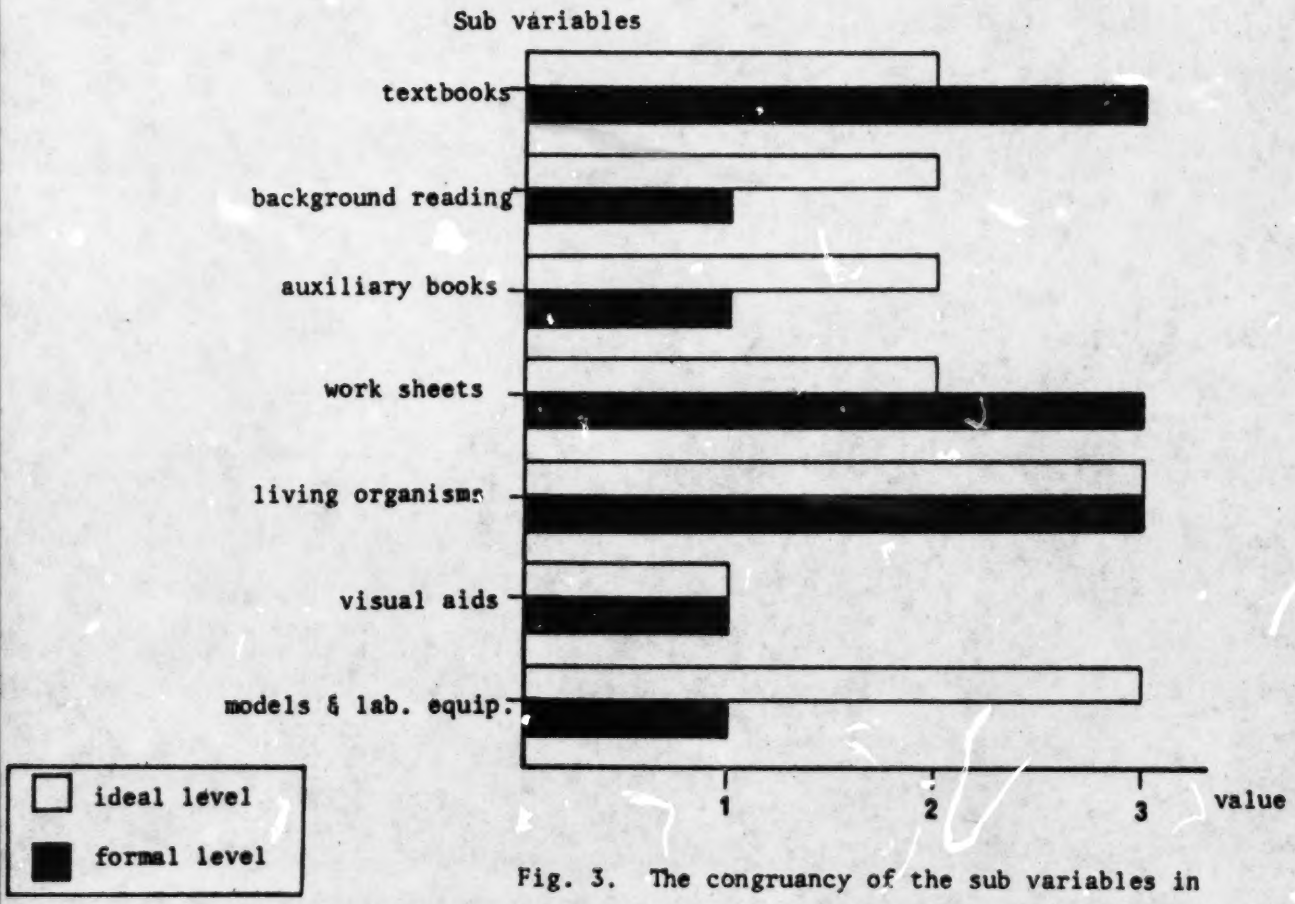



Fig. 3. The congruancy of the sub variables in <u>materials</u> between ideal and formal levels.

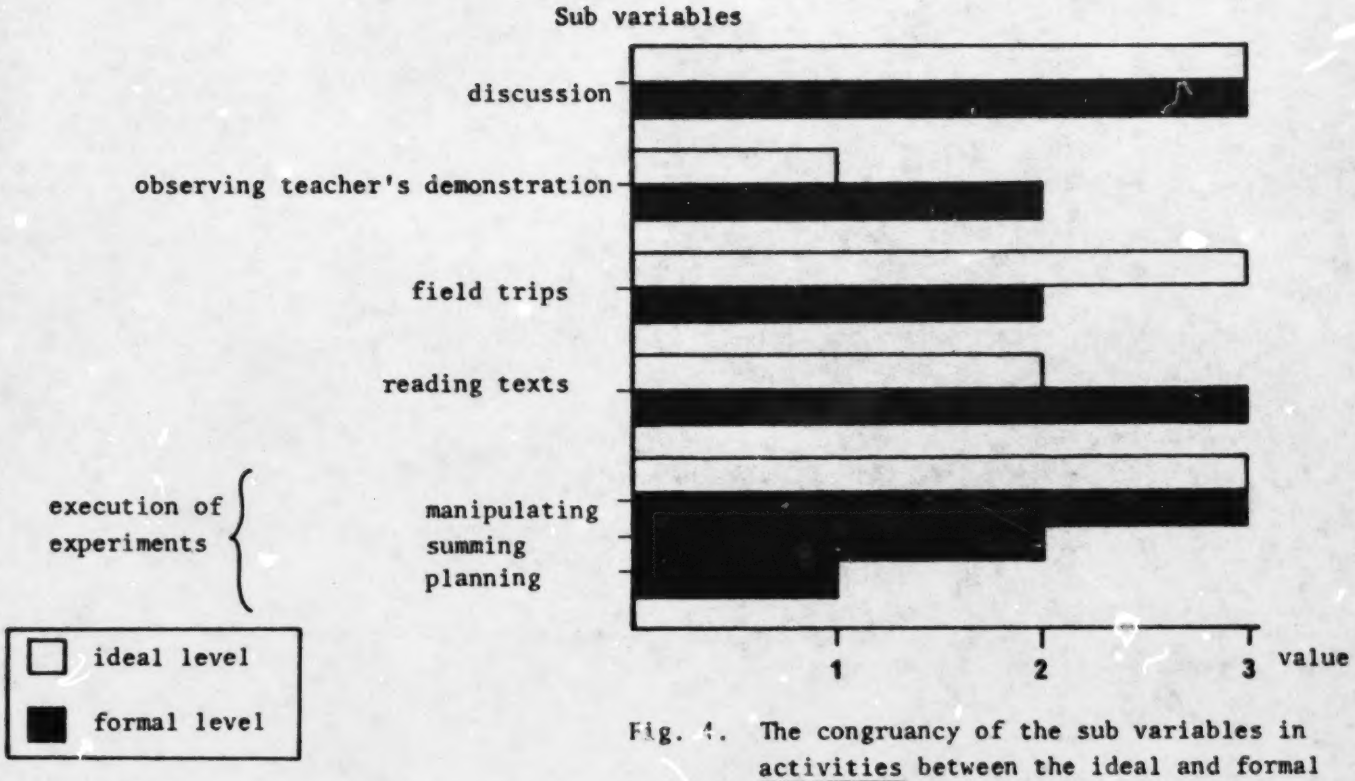



Fig. 4. The congruancy of the sub variables in activities between the ideal and formal levels.

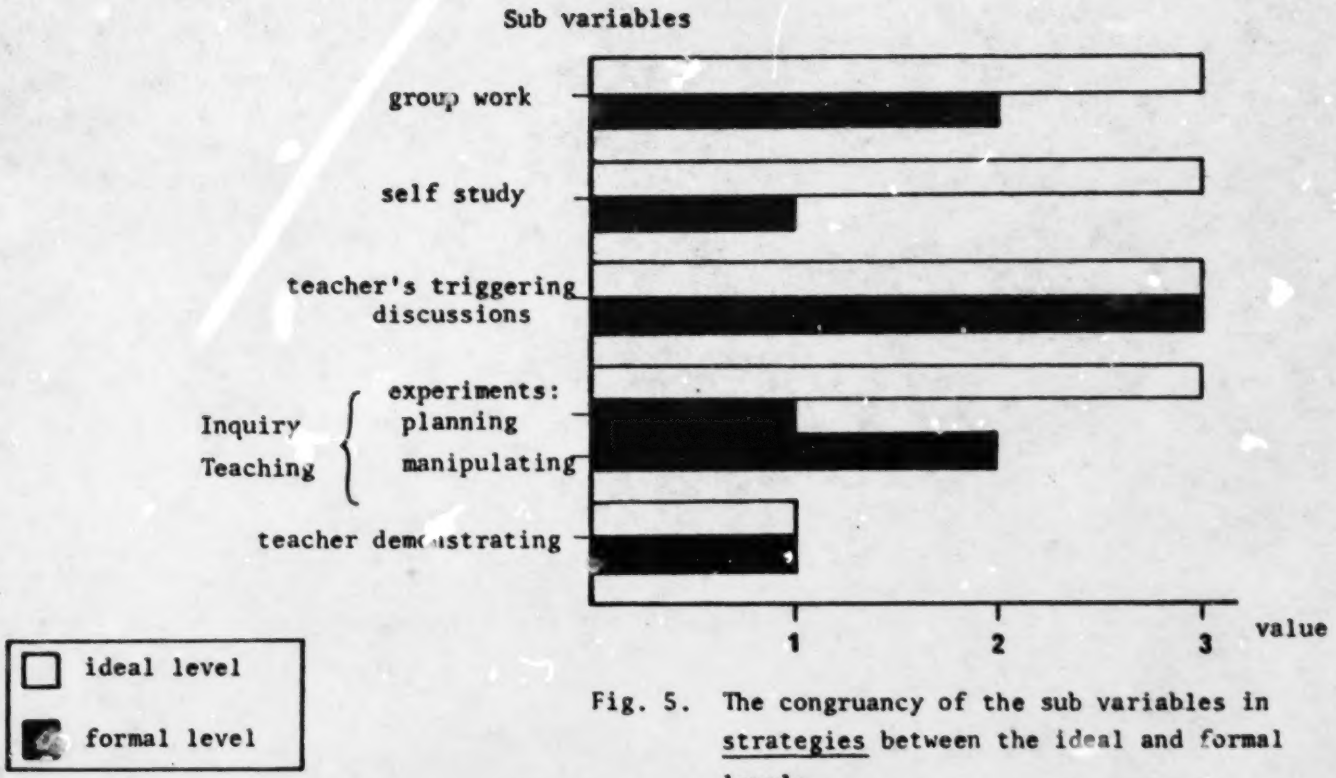


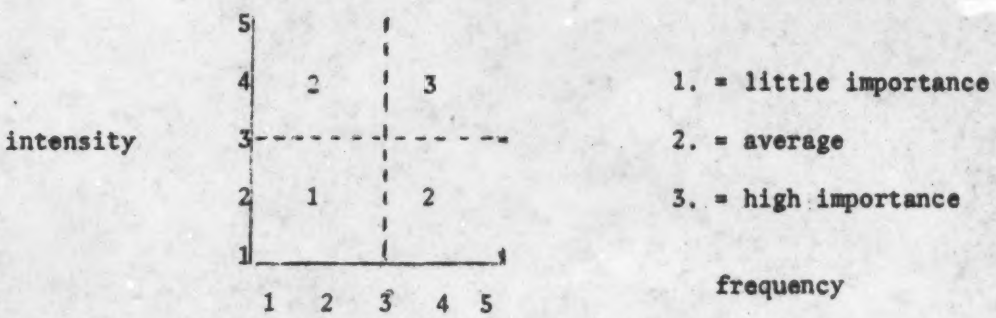

Fig. 5. The congruancy of the sub variables in strategies between the ideal and formal levels.

that variable. We divided this range by five to give a relative value score to each sub variable in that variable. i.e. Asymetrical distribution of the 5 degrees in the range between 2 to 13 is:

| I | II | III | IV | V |
|---|---|---|---|---|
| 2,3 | 4,5,6 | 7,8 | 9,10,11 | 12,13 |

So if a sub variable in that variable was mentioned 7 times it had degree level III "average" in comparison to the frequency of the other sub variable in the same variable.

Intensity: this is a more subjective value and depends partially on the analyst's impressions. The analyst assigns each sub variable a score between 1-5 based on several indicators: The intensity is expressed in repetions number of times a sub variable is mentioned; style that is used to express a specific sub variable (using emphasizing words, "must", "should" etc. or by using special printing devices (underlining, capital letters, shaded areas etc.) or by devoting a special section to the significance of a sub variable (i.e. in our case to "field trips"). In the next stage both scores of frequency and intensity for each sub variable were mapped on a two dimensional graph (see below) to obtain their final value. i.e. in the ideal level the sub variable "text book" had a low intensity score (2) but was frequently mentioned thus scored the 5th degree, therefore it got a final value in square # 2 of average importance.



Classroom observations were conducted to study the operational level. Although 42 teachers were observed for 3-4 periods, only 32 observations reports fulfilled the criteria of good naturalistic observations (Guba 1978) while the others either didn't or couldn't be analysed due to the limitations of our observations' analysis instrument. As in the ideal and formal levels, here too 2-3 judges carried out its analysis for each observation (Goren, 1977) assigning values to each sub variable. The frame of reference for comparison was the relevant formal materials that were declared by each teacher as being taught at the time of the observation * and their final analysis values. The unit of analysis was an "event" in the observation ** defined by the formal level. Here we looked for congruancy between this unit in these two levels and valued it accordingly. The refined analysis enabled us to value each sub variable in the analysed observation in three basic possible situations: Teacher doesn't implement as expected by the developers thus leading to negative discrepancy (-); teacher does implement as expected incongruancy (0) with the intentions; teacher implements with additions, expands enriches thus makes a positive increment (+). Identifying the type of situation in which the teacher performed required finer definition of these three possible implementation behaviors. The negative discrepancy could be -1 or -2 based on how far he deviated from the curriculum intentions. While positive increment could be +1 or +2 based on the extent to which the teacher used extra resources and preplanned the enrichment while maintaining the "spirit" of the developers. The major characteristics of an incongruent implementation is its fidelity to the developers prepared materials, with no special additions or omitions, no imagination yet no depriciation either. It doesn't fully utilize the curriculum potential and thus often seems as "grey implementation".

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* The analysers had to identify and define the teacher's declared sections as being taught.

** The openess in which we looked at the observed situation and the question of its appropriateness is the contribution of the qualitative approach as well as some of its hardship.

Results

Using the methodology described in the preceeding sections, findings to the following research questions are given:

1) Are their descrepancies between the original intentions and their translation to formal materials and if so in what sub variables?

Fig 2 compares the final value of the sub variables that comprise the curricular variable, "objective". Since there is an element of subjectiveness in our analysis we will mainly emphasize differences < than 1 degree positive or negative. A negative value means that the value of this sub variable has been decreased in the formal level in comparison to its value in the ideal level. While a positive value means the opposite, an increase of the sub variable value in the formal level.

The data show that, there is a similar importance given to the ideal and formal levels regarding most objectives dealing with ideas and principles in biology. Principles of the inquiry as an approach to biology teaching was highly advocated at the ideal level, but when translated to learing opportunities only in "manipulating the experiments" received the same importance. Lower significance (-2) was assigned to"defining problems and hypotheses" and "planning the experiments". Another distinct discrepancy (-2) was identified in the way the formal level treats the sub variable "caring for and respecting animals" in comparison to the high importance it has received in the ideal level. The sub variable (fig. 3) of variable materials were generally dealt in a similar way in both levels. A slight tendency for traditionalization can be observed in some sub variable when the ideal innovative intentions were translated to learning opportunities with traditional materials. They seem to pull back toward the conventional approach with greater use for "text books" and smaller use for "background and auxiliary resource books" and much smaller use of "models and lab equipments". This same trend is also observed

with the sub variables of the curricular variable, "activities", less importance (Fig. 4) is given at the formal level than at the ideal level to the following sub variables: "students planning the experiments", "field trips". At the same time a small increase in the role of "teacher's demonstrations" compared to what the original intentions were. The "discussions" and "manipulating the experiments" were equally important in the curriculum variables "strategy" and "activities". (Fig. 5) These sub variables were well expressed in the formal level.

2) Are there discrepancies between the developed learning activities and their operation in the classroom, if so in what sub variables?

While in every other level we could analyse the whole curriculum, in this level we could only analyse these sub variables in the observation that appeared in the compared relevant part of the formal material.* If in the formal materials a sub variable was offered and not implemented it was scored as a negative discrepancy with its various degrees. All the observed implemented sub variables were analysed and valued as described in the instruments. The results given in the full report (Sabar, 1982) show both the level of implementation in the range of -2 to +2 and the percent of teachers whose implementation of the specific sub variables was observed. Two distinct lists of sub variables were excerpted. One of sub variables that were observed in at least 70% of the classes. The second list is of scarce sub variables that could be observed in less than 50% of the classes. The discrepancies observed were not homogenous yet only few teachers had extreme differences (-2 or +2) from the correspondent formal materials, when implementing the materials. Following are sub variables which were infrequently offered in the studied variables:

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* Here is one other example of the difficulties we have encountered with the naturalistic approach. Having to be limited to 3-4 observed periods with one teacher yet trying to say something more deeper about the whole phenomenon.

sub variable:

| | |
|---|---|
| Objective | |
| ideas & principles | "organisms challanged environmental balance" (25%) |
| inquiry | "planning experiments & obtaining its data" (14%) |
| | "distinction between facts" (40%) |
| | "defining problems" (50%) |
| affective | "caring for animals" (37.5%) |
| materials | "auxiliary & resource" (47%) |
| activities | "field trips" (25%) "students planning experiments" (50%) |

Following are sub variables that their implementation was observed most frequently.

variable:

| | |
|---|---|
| Objectives | "Adaptability of organisms to their environment" (81%) |
| | "Similar problems different solutions" (81%) |
| | "Acquiring concepts and knowledge in the studied area (81%) |
| | "Methods for obtaining data" (81%) |
| Materials | "Text books" (97%) "work sheets" (37%) |
| | "Living organisms" (86%) |
| Activities | "Discussion" (100%) |
| | "manipulating experiments" (91%) |
| | "Summing experiments" (75%) |
| Strategies | "Group work with same tasks" (75%) |
| | "self study" (78%) |
| | "teacher's demonstrations" (72%) |
| | "discussion" (100%) |

The fact that the developers provided ample learning opportunities to some sub variables and to others almost none indicates their preferences for certain intentions of the ideal level. Finally, based on our systematic data and the open information we gathered in our observations we can say that among the objectives at least four were insufficiently treated in the materials. These were mainly the objectives which involved higher levels of inquiry i.e. "identifying facts & problems", "defining hypothesis" and "planning experiments". While "manipulating the experiments" was well treated and implemented. "Planning the method" for obtaining data was a frustrating experience because though most observed classes did work on it they soon realized that the materials actually put them into a preplanned method.. "Acquisitions of information and biological concepts" were generally well implemented. Yet objectives that were valued lower by the developers i.e. "caring for animals" were insufficiently elaborated as learning opportunities and were scarcly observed. This is also true regarding "field trips", "self planning of experiments" and the use of "auxiliary resource books". While sub variables that were highly valued by the developers as "discussion" and "manipulating experiments" were very well implemented and should be credited to the developers systematic efforts in providing learning opportunities. There were also those more conventional sub variables i.e. "acquisition of knowledge and concepts", "use of text books", "teacher's demonstrations", and "self study" in its misinterpreted way (by extensive use of work sheets), that have been valued higher thus given more use, than originally intended. We can clearly see that in most sub variables, the interpretation given by the developers to the original intentions is what mostly determines the implementation scene even when it appears different than originally intended.

Summary of the Results

The sub-variables may be classified into three categories, which differ from one another in the degree to which the intentions of the planners were realized in the different levels of the curriculum and in the reasons why these intentions were or were not realized.

1. Non-traditional sub-variables which were implemented completely.

This group includes primarily those objectives dealing with general biological principles & ideas such as "adaptability of organisms to the environment" or "similar solutions to different problems." This group also included relatively new activities such as "manipulating experiments," as well as activities and strategies related to "discussion." These were implemented fully at all studied levels of the curriculum.

By analyzing the curriculum at the ideal (its original conceptualization) and formal (the actual learning materials) levels, it appears that the complete implementation of these sub-variables stems primarily from the fact that there is complete harmony between the intentions in these areas and their translation into learning materials in the formal curriculum, and from the fact that these sub-variables were stressed frequently and forcefully through learning activities. At the same time, this finding may also be attributed to the clear manner in which the developers were able to transfer their aims, for it is due to the importance which the developers attached to each of the above sub-variables that they were carefully explained and illustrated in the teachers' guide, and were concretized in the materials for the students.

2. Traditional sub-variables which were implemented fully

This would not seem surprising, for after all, one would expect that in the implementation of a curriculum certain sub-variables which are in no way novel would also be implemented, and there is no difficulty in having these implemented at all levels. Nevertheless, in the present instance, the original planners attempted to moderate sub-variables such as "the use of textbooks," "the acquisition of concepts and knowledge from the curriculum" or "teacher demonstrations of experiments," in keeping with the new approaches in teaching the sciences.

These new approaches pride themselves on using various resource & auxiliary materials and not only textbooks; they attempt to teach principles and processes, and not to concentrate only on the gathering of information; they stress the involvement of the students in active experiments as part of the learning process, and not the passive observation of students at teacher demonstrations of experiments. Those who conceptualized this curriculum at its ideal level, therefore, tended to minimize the sub-variables in this group, and this is one of the innovations which they wished to introduce in the teaching of science.

In this group, unlike in the first group of sub-variables, there was not full harmony between the ideal and the formal levels, and it appears that already at the formal level the developers of the curriculum tended to traditionalism, and by this they were giving expression to their concerns in regard to the proposed change. In practice, the textbooks were suggested for use to a greater extent than had been the original intention and the same applied to those activities dealing with the acquisition of knowledge and concepts. As to the use of demonstrations, the developers used a certain quality of expression: many activities were suggested to the students, while in many instances the choice was left to the teacher between a demonstration or an experiment, due to the difficulties that might arise in the

carrying out of the experiment. Thus this strategy was expressed differently at the various levels of the curriculum than had been planned originally. One may deduce from this group that traditional behavior maintains a strong hold not only on teachers but also on the developers' perception of the implementors-teachers. Thus at some points the developers seem to reinforce the teachers' tendency to traditional behavior.

3. Non-traditional sub-variables which were implemented in the curriculum in ways which were not in accordance with the aims of the developers

This group includes those sub-variables which were declared by the planners at the ideal level as being important innovations which characterized the implementation of the curriculum, but whose implementation was very limited at the other levels of the curriculum, and was very different from the original intentions. We can point out, for example, the sub-variable entitled "caring for animals and respecting them", or another innovative sub-variable, "students planning of experiments", "self study," or "field trips". In all these sub-variables, there is a discrepancy between the importance attached to them at the ideal level contrasted sharply with the low-key expression given to them in the formal materials which determined the force with which they were expressed at the other levels.

One reason for the partial implementation of this group of sub-variables at the other levels of the curriculum may possibly be that, in addition to the fact that they were not expressed forcibly, teachers were not alerted to their potential in those opportunities which arose in a learning situation. Thus, for example, in regard to the sub-variable "caring for animals," the formal curriculum does not prepare the teacher for the fact that animals are liable to die in the midst of the experiments. If, for example, the teachers had been asked to devote a special period

of time to deal with the problematic aspects of dealing with animals before they began cutting off fins or injecting ink to fish, one might have been able to expect that this sub-variable would be handled more properly, even though it is not covered fully in the learning activities which were offered. Another example is the sub-variable of "field trips." The formal curriculum does not have a detailed proposal as to how to use such trips as learning experiences, and does not refer to the fact that one is able to refer back to the trip in the classroom for a long time afterwards. By looking into the findings of the analysis of the formal and ideal levels, we believe that presenting aims with strong intensity value helps to set "the spirit of the curriculum" and in understanding the aims of the developers, but in order to increase the chances of proper implementation, a high frequency of learning opportunities is needed as well. And the example of "field trip" illustrates this.

The sub-variable "self study," was given great importance in the intentions of the ideal level. But was only covered modestly in the same sense in the formal level materials. This sub variable was faced with another difficulty, and that was the conservative interpretation which is normally accepted for independent self study & activity -- homework, filling in worksheets, etc. In the absence of any details regarding the developers' concept for this sub variable in the teachers' guide, the teachers maintained their conservative interpretation.

Finally, the poorer implementation of most of the innovative sub variables of the inquiry approach i.e. "students planning of experiments" or "defining problems & hypotheses" stems from yet another possible reason. The developers choice to remain within the lower levels of inquiry (Shulman & Tamir, 1973) which is mainly the actual doing of the experiment. Apparently the developers sought it to be better suitable to the target student population.

## Discussion & Summary

One of the main reasons for undertaking this study of the implementation of school curricula was the dissatisfaction which has accompanied the implementation of new curricula. The findings of this study show that some of the objectives as to content and research approach were indeed achieved, even if they were not always utilized to their fullest.

Therefore the question to be asked is where does this feeling of dissatisfaction stem from? Looking at the analyses, the results and comparisons, it appears that this feeling could have resulted from the high expectation set at the ideal level and the discrepancies in some of the sub variables when translated to formal learning materials.

In the curriculum studied here, the planners at the ideal level wished to have the inquiry approach as central component. They believed that it was possible to offer the learner opportunities to experiment with this approach, and those methods which science uses to accumulate data. However, when the developers had to translate the ideal intentions regarding research activities into formal materials, they believed that at this stage with the target population all that possibly could be implemented was a low level of the inquiry approach. Therefore, they provided much less opportunities for students to experiment using higher levels of inquiry, i.e. where the method of study is not given or where even the problem is not given -- stages which characterize true research. Thus, in practice, the students carried out experiments which the planners had worked out in detail, even though the ideal curriculum called for them "to plan these themselves."

Such experiments, even though they give the students a greater feeling of experimenting than when the teacher is demonstrating, are still at the basic level of the inquiry approach, according to the classification of Shulman and Tamir (1973) and McIntyre and

Brown (1979), who also identified a great deal of inquiry at low levels in other science curricula.

Another factor which may possibly explain the feeling of dissatisfaction is the great deal of verbosity as opposed to the actions which are expected of new science curricula. Planners at the ideal level did believe that discussion is an integral part of a profound inquiry approach, but they contented themselves with a solitary reference to this fact, and no more. On the other hand, the place of the experiment in the curriculum was repeated many times. Thus, even if the combination of discussion and experimentation was mentioned at the ideal level, because of the nature of this level there was no detailing of possibly kinds of discussion, such as an opening discussion, a discussion as to the appropriate method of gathering of the data, and a concluding discussion. Thus when the developers translated their ideal intentions into formal materials, they found that there are five steps to the experiment (defining and phrasing the problem, planning the method for gathering the data, manipulating the experiment, the gathering of the findings, and the drawing of conclusions) and four of these are verbal and of a discussional nature, while only one has a manipulative motoric character. It is the formal curriculum which dictates to the teachers how to go about implementing it, and if discussion is central to the curriculum, it is not surprising that the classes were found to be very verbose, with much smaller amount of experimentation. Thus an observer was liable to get a negative impression because of the great deal of verbosity in the new science curriculum, when compared to his expectations of a curriculum which would be based primarily on direct experiences, the carrying out of experiments, and inquiry activities, or, as the developers of the new science curricula describe it, "hands on materials." It thus appears that an analysis of the verbal significance of instruction by means of the inquiry approach,

as was done in this study, may explain part of the feeling of disappointment in the implementation of a science curriculum, with some more insight and assigned importance than might appear at first glance.

In conclusion the study indicates that the implementation picture in Israel is not as gloomy as it might have appeared else where. The developers succeeded in transmitting a great part of their objectives through most of the curriculum levels, these include several of the objectives related to subject matter, manipulating (carrying out) experiments increasing the usage of living organisms, integrating the laboratory work into the regular class sessions and others. Yet the implementation of some other sub variables failed partially or totally, mainly with objectives derived from the affective domain and those related to higher orders of the inquiry approach. The findings also show that there was excessive usage of some conventional sub variables i.e. text books, teacher demonstrating and acquisition of knowledge. Utilizing the recommendations of this study, evaluators and decision makers may re-evaluate the appropriateness of the original expectations to the target student population, note how much of formal opportunities have been actually implemented and perhaps help to develop and regain a more positive attitude and support toward new science curriculum.

## RECOMMENDATIONS

1. This study shows that it is possible to implement a goodly number of the intentions of the planners, provided there is a clear expression of these intentions in the resource materials at the formal level. It follows that in order to implement objectives which were not expressed in the curriculum, i.e. higher levels of inquiry or fostering attitudes there is a need to plan learning opportunities and activities for the formal level. A declaration of intentions at the ideal level alone is not enough to guarantee the realization of these intentions in the process of learning.

2. In addition to the development of suitable formal materials which are appropriate for the declared objectives, there is a need for clear and specific definitions of the intentions of the planners, so that there will not be a great deal of room for conservative interpretations. For example, in order to guarantee the use of a strategy of "self study," it is not enough to limit oneself to a declaration of its importance. Developers should see to it that the teachers who implement the curriculum will know clearly what this is, and they should be trained in accordance with the new interpretation, for if this is not done they will "flee" to conservative interpretations, such as filling in workbooks or homework, which were not the intentions of the planners.

3. Those who are involved with the preparing and in-service training of teachers may also offer an important contribution to the proper implementation of the curriculum. They must make a detailed analysis of the objectives of the curriculum and must examine the degree of agreement between these and the resource formal materials which are

offered. Such an analysis can locate the places where the teacher is called upon to offer his own initiative in the spirit of the curriculum, and the teachers will be able to be prepared accordingly, in terms of the skills & competancies needed for the implementation of the curriculum.

4. It is recommended that teachers be encouraged to develop independently additional activities and resource materials which are in the spirit of the curriculum, and which are in keeping with the intentions of the developers. Other studies have shown that in such a process the teachers are likely to internalize the intentions of the planners and to better implement the given resource materials.

## References

Adar, L., & Fox, S., An Analysis of the Use and Content of a History Curriculum, Jerusalem, The Hebrew University, 1978. (In Hebrew).

Anderson, S.B., Ball, S., Murphy, R.T., & Ass. Discrepancy Evaluation, in Encyclopedia of Educational Evaluation, London, Jossey-Bass, Publishers, 1975.

Ben Peretz, M., Concept of Curriculum Potential. Curriculum Theory Network, Vol. 5(2), 1975, pp. 151-159.

Eash, M.J., Developing an Instrument for Instructional Materials, in Weiss J. (ed.), Curriculum Theory Network, Monograph Supplement, no. 8/9, 1972, pp. 193-221.

Eraut, M.R., et al., Volkswagen Curriculum Analysis Project, Sussex, Educatinn Development Centre, University of Sussex, 1974.

Fullan, A. & Pomfret, A., "Research on Curriculum and Instruction Implementation", Review of Educational Research, Vol. 47, no. 2, 1977.

Gallagher, J.J., Teacher Variation in Concept presentation in B.S.C.S. Programs. B.S.C.S. Newsletter, no. 30, Boulder, Colorado, 1967, pp. 8-19.

Goodlad, J.I., & Klein, M.F., Behind the Classroom Door, Worthington, Ohio, Charles B. Jones, 1970.

Goodlad, J.I., "What Goes on in our Schools?" Educational Researcher, 1977, Vol. 6 (3), pp. 3-6.

Goodlad, J.I., Klein, M.F. & Tye, K.A., "The Domains of Curriculum and Their Study", in Goodlad J.I. & Ass. Curriculum Inquiry, The Study of Curriculum Practice, N.Y., McGraw Hill Book Company, 1979.

Görn, L., Expert Judgements as Evaluation Data, Handbook of Curriculum Evaluation, A Levy (ed.) Paris, UNESCO, 1977.

Grobman, H. The Content-Analysis in Formative and Summative Evaluation of Curriculum, Paper Presented at the 4th Asian Regional Conference in Education. Jerusalem, 1972.

Guba, E.G. Toward a Methodology of Naturalistic Inquiry in Educational Evaluation. Center for Study of Evaluation, Los Angeles, Univ. of California, 1978.

Herron, M.D. On Teacher Perception and Curricular Innovation. Curriculum Theory Network, no. 7, 1971, pp. 47-53.

Kempa, R.F., "Studying Curriculum Implementation in the Classroom", in: Tamir, P. Blum, A., Hofstein, A., & Sabar, N., (eds.): Curriculum Implementation and its Relationship to Curriculum Development in Science, Jerusalem, Israel Science Teaching Center, Hebrew University, 1979.

Klein, M.F., Tye, A.K., Wright, E.J., A study of schooling: Curriculum Phi Delta Kappan, December, 1979, pp. 244-248.

McIntyre, D. & Brown, S., Science Teachers Implementation of two Intended Innovations Mixed Ability Teaching and Guided Discovery Methods, in: Tamir (et al, eds), Curriculum Implementation and its Relationship to Curriculum Development in Science, Jerusalem, Israel Science Teaching Center, Hebrew University, 1979.

Provus, M., Discrepancy Evaluation, Berkeley, Calif., McCuthan, 1971.

Sabar, N., The Metamorphosis of a Biology Curriculum starting with the Developers Conception all the Way Through its Perception by the Students, Tel-Aviv, School of Education, Tel-Aviv University, 1982. (In Hebrew)

Silberstein, M. (ed.) The organism and its environment. Tel-Aviv, Maalot, 1971.

Stake, R.E., Case Studies in Science Education, Center for instructional research and Curriculum evaluation, University of Illois, Urbana, 1978.

Tyler, L., Klein, F.M., & Michael, M. Recommendations for Curriculum and Instructional Materials, Los Angeles, Tyler Press, 1971.